

Digital Preservation at Mesa Prieta Petroglyph Project

A White Paper on Assessment and Procedure

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Project Focus, Need, and Long-Term Goals

Mesa Prieta, located in Rio Arriba County north of the Tewa pueblo of Ohkay Owingeh and near the rural area of Verlade, New Mexico, is perhaps the largest petroglyph site in New Mexico, with over 66,000 petroglyph images and many other cultural landscape features such as trails, structures and artifacts, dating from 10,000 years ago to the present. For 14 years the Mesa Prieta Petroglyph Project has been conducting a nationally-recognized, award-winning program of documenting the thousands of petroglyphs in this unique cultural resource through the use of trained teams of adult volunteers and a Summer Youth Program that provides paid internships and training to local Pueblo and Hispano youth.¹ MPPP creates documentation of the petroglyph and other cultural features using digital photos and paper forms to gather data according to the standards developed by the Archaeological Society of New Mexico Rock Art Council.² The project has maintained excellent organization of these born-digital media, creating lower resolution thumbnails for access purposes and creating three copies of the original full-resolution images, stored in separate locations in the Verlarde area. However, so far the preservation method for the born-digital files consists of copies on DVDs and a removable hard drive, leaving these files vulnerable. Recording continues year-round so new records are being added.

The proposed project seeks to improve digital preservation of these important born-digital records. Using the framework developed by the Library of Congress (LOC) National Digital Stewardship Alliance (NDSA), the Mesa Prieta Petroglyph Project (MPPP) would work with a trained archivist and use the NDSA's Levels of Digital Preservation (Appendix A) to assess their current digital preservation situation and develop and implement a preservation scheme for their digital materials. In contrast to the evaluations used to audit a Trusted Digital Repository³ or TRAC-certified trustworthy digital repository,⁴ the NDSA Levels of Digital Preservation⁵ allow evaluation of progress towards better digital preservation. Using the NDSA Levels of Digital Preservation also further underscores that in the real world, the many "preservation issues [involved with digital holdings] do not all have to be dealt with at the same time"⁶ but that incremental approaches are often the most practical and most achievable, and gives a way to plan steps and to evaluate how they really make a difference.

A 2014-2015 preservation grant from the New Mexico Historical Records Advisory Board (NMHRAB) allowed study and action to improve the digital preservation of its digital holdings. Another goal of the grant project is to document and share our process to aid other custodians of born-digital historic records in New Mexico.

1 <http://www.mesaprietapetroglyphs.org>

2 <http://newmexico-archaeology.org/recording-guidelines-and-tools/>

3 A benchmark established in 2002; <http://www.oclc.org/content/dam/research/activities/trustedrep/repositories.pdf>

4 TRAC audit and certification was established in 2007

http://www.crl.edu/sites/default/files/d6/attachments/pages/trac_0.pdf and updated as an ISO standard in 2012 (ISO 16363:2012).

5 Library of Congress National Digital Stewardship Alliance

<http://www.digitalpreservation.gov/ndsa/activities/levels.html> ; see also Phillips, M., Bailey, J., Goethals, A., & Owens, T., "The NDSA Levels of Digital Preservation: An Explanation and Uses." in *Proceedings of the 2013 IS&T Archiving Conference* http://www.digitalpreservation.gov/ndsa/working_groups/documents/NDSA_Levels_Archiving_2013.pdf

6 Minor, Meg. "Digital Preservation Strategies for a Small Private College." Society of American Archivists, Campus Case Studies, Case 16. May 2015. p. 7-8.

About the Organization: Mesa Prieta Petroglyph Project

MPPP maintains cultural resource recording and youth and public education programs for a uniquely rich cultural resource in Northern New Mexico. The MPPP draws well on a range of highly expert and experienced professionals, who include top-ranking professors in New Mexico, the Director of Research of the Maxwell Museum of the University of New Mexico, Cultural Consultants from area Pueblos, and staff of the state's archaeology unit (Office of Archaeological Studies), as well as museum experts and personnel experienced with youth education and with running efficient logistics. As guardians of a significant archaeological resource, MPPP restricts access to locational information to trained personnel, and conducts active participatory educational programs with youths and adults in the area, including with STEM-based curriculum for schools.⁷

MPPP has over a decade of experience recording the petroglyphs and cultural features of the mesa currently known by the names Black Mesa or Mesa Prieta. MPPP has historically concentrated its efforts on the area given to the Archaeological Conservancy by former landowner and petroglyph preservationist Katherine Wells. In recent years, with landowner permission, MPPP has also conducted survey and recording on adjacent private property, sharing the report with the landowner.

MPPP utilize a standardized, well tested recording scheme based on the standards developed by the Archaeological Society of New Mexico's Rock Art Council. MPPP has developed and maintains particularly excellent volunteer training procedures and materials, and produce timely reports of their recording work. As an organization, MPPP has grown to recently have been able to now have a full time project director, archaeologist Janet MacKenzie, MA, and is governed by a board including representative of the pueblos of Ohkay Owingeh, Santa Clara (Kha'po Owingeh), and other area communities.

While effectively engaging experienced adult volunteers (last year included 37 volunteer surveyors and recorders working in 12 teams), the MPPP also runs a Summer Youth Program providing local Pueblo Indian and Hispano youth paid training in cultural resource recording and scientific methods. This program in 2011 won a national TAKE PRIDE IN AMERICA AWARD, and sent five local young people to Washington DC to receive the award at a ceremony at the White House.

Digital Preservation

The Library of Congress defines Digital Preservation as “the active management of digital content over time to ensure ongoing access.”⁸ It is the care and feeding needed to take care of our digital stuff. Sometimes digital preservation is talked about in concert with reformatting an object into a digital medium in order to be able to better preserve the content – one example is transferring the content of a VHS video tape into a digital format, to save the content from the decaying magnetic tape – or creating a digital copy to improve user access and preserve the original from damage through handling – such as

7 <http://www.mesaprietapetroglyphs.org/dedicated-to-education.html>

8 LOC National Digital Information Infrastructure and Preservation Program <http://www.digitalpreservation.gov/about/> . The University of Michigan also provides a useful overview of digital preservation at <http://www.lib.umich.edu/preservation-and-conservation/digital-preservation/what-digital-preservation> .

making photographs or scans of a historic photo album so that the digital images can be used in most cases while the original is preserved in storage. While both of these instances require a digital preservation system be in place to make the results lasting, they are not digital preservation steps in and of themselves. In this paper we discuss digital preservation separately from reformatting for preservation.

Digital Preservation Costs

In providing training in Digital Preservation for the Society of American Archivists, Kelcy Shepherd (2013) highlights the financial costs of digital preservation that must be planned for. These “Preservation Costs in a Nutshell” include the financial costs associated with:

1. Writing and upkeep of plans and policies
2. Training staff
3. Selecting and implementing a system/solution/service
4. Developing/maintaining software
5. Selecting assets to preserve
6. Documenting those assets (metadata)
7. Data wrangling those assets such that they can be preserved
8. Assessing / monitoring those assets' viability over time (and the system/solution/service used as well)
9. Infrastructure costs (hardware, physical space, utilities)
10. All of the people who assist in the above

These costs are not insubstantial and must be planned for, otherwise, if digital preservation is left as an “add-on” to existing workloads without additional resource allocation and training for affected personnel, the project is likely to be left incomplete and the digital material left at risk.

Grant Project Process

To assist with the financial costs associated with planning for an implementing digital preservation, MPPP applied for a preservation grant to hire a professional archival consultant with experience in preserving born-digital data. Project activities of the consultant included to:

1. conduct an assessment of Mesa Prieta Petroglyph Project's born-digital data according to the Library of Congress Levels of Digital Preservation framework and provide a written report to the project director;
2. develop a digital preservation strategy for the organization;
3. conduct board training on digital preservation issues;
4. write a digital preservation policy;

5. conduct staff and volunteer training on implementing the digital preservation policies;
6. write a white paper to share results.

Early on in the process it was determined that it would be cost effective and sustainable for MPPP to improve digital preservation of their material by using a digital preservation server service. At the time MPPP had only one part-time staff member, no paid IT service, and depended on the part time staff member and a long time dedicated volunteer storing separate copies of MPPPs digital assets in their homes, both located nearby, in – as risk managers say – the same disaster zone of northern New Mexico. Using a digital preservation server service would not require purchase of new equipment, and would minimize to the extent possible the amount of time and training required by MPPP personnel. With a suite of auditing and monitoring processes provided in the selected digital preservation server service (described in more detail below), once MPPP uploaded its digital assets into the server, it would only have to add new content as created and pay the fixed annual fee (based on total data space allocated), and no maintenance would be required on the part of MPPP.

Selecting a Digital Preservation Server

The process of selecting a digital preservation server will need to include consideration of an appropriate match between financial cost, human resources required from your institution, and considerations such as whether any license is granted to your content if you use the service, and if so, if that is a match for your institution. The Preserving Digital Objects with Restricted Resources (POWRR) project, a collaboration of universities in Illinois, with IMLS and NEH support created a useful comparison grid of tools with narrative about each.⁹ This has been succeeded by the POWRR Tool Grid v2, a dynamically generated grid that draws on updates from a user editable wiki.¹⁰

The following price quotes for four different services derive from digital preservation training materials of archivist Kelcy Shepard:

Preservation Server Service	Subscription Costs (as of 2013)
DuraCloud	DuraCloud Preservation Storage In Amazon S3: \$1,500 for 1st TB; \$1,000 for additional TBs Standard features DuraCloud Preservation Plus 1. Storage in Amazon S3 + Amazon Glacier: \$1,635 for 1st TB; \$1,135 for additional TBs 2. Storage in Amazon S3 + SDSC:

⁹ <http://digitalpowrr.niu.edu/tool-grid/> 2013.

¹⁰ <http://www.digipres.org/tools/about/>

	\$2,500 for 1st TB; \$1,700 for additional TBs a. Standard features + synchronization, choice of secondary cloud storage providers, automatic file recovery DuraCloud Enterprise • Storage in Amazon S3: \$5,900 for 1st TB; \$1,000 for additional TBs ○ Standard features + media serving, account mgt, subaccounts, access controls, user mgt DuraCloud Enterprise Plus • Storage in Amazon S3 + Amazon Glacier: \$6,035 for 1st TB; \$1,135 for additional TBs • Storage in Amazon S3 + SDSC: \$6,900 for 1st TB; \$1,700 for additional TBs ○ Standard features + synchronization, choice of secondary cloud storage providers, automatic file recovery, media serving, account mgt, subaccounts, access controls, user mgt
OCLC Digital Archive	• Content can be uploaded from CONTENTdm or other digital asset management system • Annual storage ○ \$500/100gb up to 1TB; \$200/100gb 1TB-2TB; more than 2TB custom quote • Fees for batch uploading, ○ except no fee when uploading online from CONTENTdm or OCLC Connexion • Fees for dissemination • Fees for format migration

MetaArchive	• Cooperative, not vendor • All members actively participate ○ Three tiers of membership: ▪ <u>Preservation</u>: \$3,000/year ▪ <u>Collaborative</u>: \$2,500/year + \$100/year for participants ▪ <u>Sustaining Membership</u>: \$5,500/year • \$1/GB/year preservation fee • <\$5K server cost; purchase every 3 years
Chronopolis	• (started by Library of Congress funding, based at UCSD) • Collaborative, distributed preservation • IRODS based infrastructure • Three copies, stored across the US • ACES monitoring • Trustworthy Repository Audit Certification (TRAC) certified • Initial offering, \$2200/TB/year for non-University of California users

About MPPP's Selected Digital Preservation Storage System

The off-site, geographically distributed, professionally staffed server service selected for MPPP's digital preservation project is the Chronopolis system.¹¹ The Chronopolis Digital Preservation Network, based at University of California San Diego, was begun through a Library of Congress National Digital Information Infrastructure Preservation Program, and is maintained through the expertise and resources of its four partner organizations, the San Diego Supercomputer Center, the UCSD Libraries, the National Center for Atmospheric Research, and the University of Maryland Institute for Advanced Computer Studies. For clients entering into a digital preservation service agreement with Chronopolis, three copies of their material is stored and simultaneously maintained at the partner's institutional servers, located in San Diego, California; Boulder, Colorado; and College Park, Maryland.

Chronopolis has earned a "Trustworthy Digital Repository" certification in the stringent Trustworthy Repositories Audit Certification (TRAC) audit of the Center for Research Libraries (CRL).¹² The

¹¹ <https://libraries.ucsd.edu/chronopolis/>

¹² <https://libraries.ucsd.edu/chronopolis/trac/index.html> ; read audit report at <http://www.crl.edu/reports/chronopolis-audit-report-2012>

initial TRAC audit and certification requirements are available in a 2007 document of the Online Computer Library Center (OCLC), CRL, and the US National Archives and Records Administration.¹³ In 2012 the International Organization for Standardization (ISO) standard 16363 was formalized as the international standard for audit and certification of trustworthy digital repositories (ISO 16363), setting out comprehensive metrics for what an archive must do, based on requirements to provide long-term preservation of digital information.¹⁴ Few preservation servers have yet met the technical and administrative requirements to become TRAC-certified.

Chronopolis uses the iRODS architecture (the Integrated Rule-Oriented Data System) to federate the partner sites and to replicate data among them.¹⁵ It provides logs on where in the storage system the objects can be found, whether there are any errors, etc. An Audit Control Environment (ACE) uses cryptographic hashes to monitor digital objects at each storage node and detect if any inappropriate changes have occurred, such as file corruption.¹⁶ The ACE delivers error alerts to human system administrators, and data can be recopied from another Chronopolis storage node.

A Data Portal is also provided that allows clients, via a web interface, to view various details of the status of their items stored in Chronopolis.

Further details of the operations of the Chronopolis Digital Preservation Network are available in the following publications:

“Center for Research Libraries - Chronopolis Audit Report 2012.”

<http://www.crl.edu/archiving-preservation/digital-archives/certification-and-assessment-digital-repositories/chronopolis>

“Chronopolis Trustworthy Repositories Audit Certification (TRAC) Self-Audit 2012”

<https://libraries.ucsd.edu/chronopolis/trac/index.html>

Minor, David et al. “Chronopolis Digital Preservation Network.” *International Journal of Digital Curation* 5.1 (2010): 119–133. www.ijdc.net.

Overview of Digital Preservation Process

The purpose of this project is to bring the born-digital files curated by the Mesa Prieta Petroglyph Project to Level 1 or higher of the Library of Congress’s National Digital Stewardship Alliance (NDSA) Levels of Digital Preservation.

A draft Digital Preservation Policy was created and presented to MPPP's Project Director and MPPP's board as part of board training in the needs around digital preservation. The draft Digital Preservation Policy is available in Appendix B.

13 http://www.crl.edu/sites/default/files/d6/attachments/pages/trac_0.pdf

14 http://www.iso.org/iso/catalogue_detail.htm?csnumber=56510

15 https://libraries.ucsd.edu/chronopolis/files/trac/chronopolis_TRAC_self_audit.pdf

16 <https://libraries.ucsd.edu/chronopolis/infrastructure/index.html>

Initial Plan

From initial contact with MPPP, the consulting archivist understood the current process of MPPP in preserving their born-digital files is that the files related to each recording project are burned to DVD, with detailed metadata about each file being entered into a standardized spreadsheet. The digital preservation project was conceived in a way that would not require altering MPPP's procedure for collecting and entering the metadata for each file, or the workflow of arranging a batch of digital-born files for each recording project. It would, however, generate an additional metadata – the information needed to track file fixity (via a cryptographic hash) – create disk images of the DVDs, to allow bit-level preservation of the born digital files, and upload the now ‘virtual’ discs into the redundant and geographically distributed Chronopolis system.

To cause minimal disruption to MPPP's already established workflows, the initial draft plan focused on copying material off of at-risk DVDs,¹⁷ and creating bit-level preservation of the files as burned to DVD. Like Chronopolis itself, MPPP would use the LOC developed tool BagIt to create a way of upload large amounts of content, and ensure a way to check that content uploaded could be checked against content received.¹⁸

Digital Preservation Process – Initial Draft

The steps MPPP currently takes to maintain their born-digital files is that the files related to each recording project have been burned to DVD, with detailed metadata about each file being entered into a standardized spreadsheet. This digital preservation project will not alter the procedure for collecting and entering the metadata for each file, or the workflow of arranging a batch of digital-born files for each recording project. It will, however, generate an additional metadata – the information needed to track file fixity (via a cryptographic hash) – create disk images of the DVDs, to allow bit-level preservation of the born digital files, and upload the now ‘virtual’ discs into the redundant and geographically distributed Chronopolis system.

The basic process will be:

¹⁷ According to recent guides of the US National Archives and the Library of Congress, optical media such as CDs and DVDs have an “experiential life expectancy” of two to five years or less. US National Archives and Records Administration, “Frequently Asked Questions (FAQs) about Optical Storage Media: Storing Temporary Records on CDs and DVDs” <http://www.archives.gov/records-mgmt/initiatives/temp-opmedia-faq.html> ; Shahani, Chandru J., Basil Manns, and Michele Youket, “Longevity of CD Media: Research at the Library of Congress” Preservation Research and Testing Division, Library of Congress, Washington, DC, <http://www.loc.gov/preservation/resources/rt/studyofCDlongevity.pdf> ; see also <http://www.loc.gov/preservation/care/record.html> ; <http://kotaku.com/your-cds-dvds-wont-last-forever-1576599642> ; <http://www.theatlantic.com/technology/archive/2014/05/the-library-of-congress-wants-to-destroy-your-old-cds-for-science/370804/> . Factors that aid preservation of DVDs and CDs include: 1) reducing or eliminating temperature extremes; 2) only touching discs at the center and edge; 3) storing optical media in jewel cases, or other container where the disc is only touched at the center hole; and 4) labeling optical discs only at the clear center portion with permanent marker, to avoid marker or any label from potentially damaging the data area. However, as detailed by the National Archives and the Library of Congress, these preservation steps do not protect data from inherent instability from the materials of the disc itself.

¹⁸ <https://libraries.ucsd.edu/chronopolis/infrastructure/index.html>

3. Identify, label, and arrange, and create a list of the physical storage medium (mainly DVDs) according to recording project and date created. The steps 2 and 3 will then be conducted with each DVD.
4. Create digital preservation-related metadata of the files that were backed up onto the DVD, using the software application Karen's Directory Printer. Include file type, filename, date created, date modified, date last accessed, and md5 hash.
5. Use BitCurator running in a Virtual Box (emulated Ubuntu/Linux environment) to access the Guymager disk imaging tool. (Lee, et al., 2013, Woods, et al., 2013, Woods, et al., 2011, http://wiki.bitcurator.net/index.php?title=Creating_a_Disk_Image_Using_Guymager)
6. Add to the list of the physical storage medium created in Step 1 the corresponding filenames of the disc images and filenames of the related spreadsheets of digital preservation-related metadata.
7. Batch the digital items, including spreadsheet from Step 4, and use the Library of Congress-developed transfer application, BagIt, to achieve upload into Chronopolis system. BagIt, an application that allows authentication that the files sent have arrived unaltered at the destination, and facilitates transfer over networks, is the standard ingest process for Chronopolis (<https://confluence.ucop.edu/display/Curation/BagIt> , Minor 2010).
8. Receive reports from Chronopolis system administrators and view uploaded items using Chronopolis web-based data portal.

Documentation created as part of the project will allow the organization to continue this digital preservation practice with additional materials acquired after the close of this project.

References Cited:

Lee, Christopher et al. From Bitstreams to Heritage: Putting Digital Forensics into Practice in Collecting Institutions. University of North Carolina: the BitCurator Project, 2013.
<http://www.bitcurator.net/docs/bitstreams-to-heritage.pdf>

Minor, David et al. "Chronopolis Digital Preservation Network." International Journal of Digital Curation 5.1 (2010): 119–133. www.ijdc.net.

Wood, Kam, Lee, Christopher Lee, and Garfinkel, Simson. "Extending Digital Repository Architectures to Support Disk Image Preservation and Access." JCDL'11 Proceedings of the 2011 ACM/IEEE Joint Conference on Digital Libraries: June 13-17, 2011, Ottawa, ON, Canada. Ed. Association for Computing Machinery ACM/IEEE Joint Conference on Digital Libraries et al. New York, NY: Association for Computing Machinery, 2011. Open WorldCat. Web.

Woods, Kam, Christopher Lee, and Sunitha Misra. "Automated Analysis and Visualization of Disk Images and File Systems for Preservation." Proceedings of Archiving 2013. Springfield, VA: Society for Imaging Science and Technology, 2013. 239–244.

Revised Plan

MPPP does not use a database to manage its digital content. Rather, folder structures and metadata-rich filenames are used to identify items and represent the relationships of part to whole.¹⁹ Following closer study of workflows during the site visit to MPPP, the consulting archivist understood that in addition to the DVDs burned for individual segments of the recording project, all MPPP's content also currently existed on a single external hard drive. Further, any of MPPP's digital assets were subject to edits as new notes might be added. As this also occasioned burning a new access copy of the DVD containing all the data for an individual segment and required not insignificant time to create the new disc and replace old copies with it, suggestions were made for ways to add additional notes as notes, rather than having to annotate digital photos or scanned paper documents with the new notes. But MPPP's need to be able to update a batch of material remained, and needed to be taken into consideration when designing the digital preservation workflow.

As a main feature of the field of digital preservation is that particular methods and processes are always changing, it should perhaps be no surprise that our initial draft workflow was revised. In fact, in the time between applying for the NMHRAB preservation grant, and the start-work period of the grant, Chronopolis itself announced a change, that it was entering partnerships with DuraSpace and Digital Preservation Network to enhance its offerings.²⁰ This meant delays to portions of our project, as the partnership was still being fully developed, and with a promised change to the user interface that would make it more user friendly and more automated.

Not knowing what that interface would look like, our progress in designing MPPP's digital preservation workflows was arrested as we waited for news and stayed in contact with the Chronopolis project team. The project teams did not wish to delay MPPP's timely completion of their grant project, and this situation was resolved in April 2015, using an MOU that allows for the start of MPPP's digital preservation server service with DuraCloud, and when the DuraSpace/DuraCloud partnership with Chronopolis is fully operationalized, DuraCloud will copy MPPP's stored data from its current home with Amazon S3 to the TRAC-certified Chronopolis storage.²¹ At that time MPPP's digital content will be at Level 4 for the Levels of Digital Preservation for Storage and Geographic Location, Level 4 for File Fixity and Data Integrity, Level 3 for Information Security, at least Level 2 for Metadata, and at least Level 2 of File Formats.

While the project was delayed, one outcome was the new availability of a much more user friendly interface – a Graphical User Interface (GUI) available in web browser – and an automated upload process. This means that MPPP is able to set fully automated uploads of its digital content. As MPPP will be updating some of this content, the tool is set to upload updated content but not overwrite the previous content, so that “good” preserved content isn't accidentally overwritten by a local corrupt copy. DuraCloud generates a file fixity measure – a checksum – of the content to be uploaded, and then checks that against the file fixity measure of the uploaded content it received, so it verifies that the

19 Naruta-Moya, Anna. “Records Management at Mesa Prieta Petroglyph Project: Site Visit and Assessment.” Report delivered to Janet MacKenzie, Project Director, Mesa Prieta Petroglyph Project, Verlarde, New Mexico. December 17, 2014

20 <https://libraries.ucsd.edu/chronopolis/dpn/index.html>

21 Memorandum of Understanding between DuraSpace and Mesa Prieta Petroglyph Project, April 2015.

content has been transferred with fidelity. However DuraCloud has no way to distinguish whether the upload tool is uploading a file the user meant to change, or whether an unintended change such as a file corruption has occurred.

Services like Amazon S3 do not have the benefits of a TRAC-certified preservation server, and so to bridge the gap DuraSpace runs file fixity checks across content it has stored in Amazon S3 servers.²² The financial cost for MPPP's annual subscription to the Chronopolis – DuraCloud preservation server service is \$2000 for up to 1TB a year. This also includes technical support from DuraCloud.

Appendix B provides a copy of MPPP's procedures for their use of the preservation server. Note that it includes not only an orientation to the digital preservation activity and procedures, but also instructions on what one would need to do in order to restore files from the digital preservation server to the local computer workstation.

MPPP's Digital Preservation Policy provides for review of the digital preservation procedures at least every two years, and review of the Digital Preservation Policy at least every five years. Review of this frequency is needed to be able to assess whether current techniques are meeting current needs, or whether the digital preservation implementation needs to be again evolved. Together, these documents show the value MPPP places on its born digital and scanned holdings, and evinces and operationalizes MPPP's commitment to ensuring continuing access to these digital documents.

About the Consulting Archivist

Anna Naruta-Moya, PhD, CA, holds a Digital Archives Specialist Certification from the Society of American Archivists, is a Certified Archivist of the Academy of Certified Archivists, and is a member of the Society of American Archivists Archival Standards Committee. She earned her PhD from the University of California, Berkeley, and has served as an archivist for the Hoover Institution Archives, Stanford University, and the US National Archives. Anna also serves as a consulting archivists for institutions including the Santa Fe Opera, on projects that do include preservation reformatting of at-risk material including unique VHS videos and oral history audio cassettes.

22 <http://www.duracloud.org/tour> ; <http://www.duracloud.org>

Appendix A

National Digital Stewardship Alliance (NDSA) Levels of Digital Preservation

From <http://www.digitalpreservation.gov/nds/activities/levels.html>

Table 1: Version 1 of the Levels of Digital Preservation

	Level 1 (Protect your data)	Level 2 (Know your data)	Level 3 (Monitor your data)	Level 4 (Repair your data)
Storage and Geographic Location	- Two complete copies that are not collocated - For data on heterogeneous media (optical discs, hard drives, etc.) get the content off the medium and into your storage system	- At least three complete copies - At least one copy in a different geographic location - Document your storage system(s) and storage media and what you need to use them	- At least one copy in a geographic location with a different disaster threat - Obsolescence monitoring process for your storage system(s) and media	- At least three copies in geographic locations with different disaster threats - Have a comprehensive plan in place that will keep files and metadata on currently accessible media or systems
File Fixity and Data Integrity	- Check file fixity on ingest if it has been provided with the content - Create fixity info if it wasn't provided with the content	- Check fixity on all ingests - Use write-blockers when working with original media - Virus-check high risk content	- Check fixity of content at fixed intervals - Maintain logs of fixity info; supply audit on demand - Ability to detect corrupt data - Virus-check all content	- Check fixity of all content in response to specific events or activities - Ability to replace/repair corrupted data - Ensure no one person has write access to all copies
Information Security	- Identify who has read, write, move and delete authorization to individual files - Restrict who has those authorizations to individual files	- Document access restrictions for content	- Maintain logs of who performed what actions on files, including deletions and preservation actions	- Perform audit of logs
Metadata	- Inventory of content and its storage location - Ensure backup and non-collocation of inventory	- Store administrative metadata - Store transformative metadata and log events	- Store standard technical and descriptive metadata	- Store standard preservation metadata
File Formats	- When you can give input into the creation of digital files encourage use of a limited set of known open formats and codecs	- Inventory of file formats in use	- Monitor file format obsolescence issues	- Perform format migrations, emulation and similar activities as needed

Appendix B – MPPP's Draft Digital Preservation Policy

Mesa Prieta Petroglyph Project Digital Preservation Policy DRAFT

The purpose of Mesa Prieta Petroglyph Project's Digital Preservation Policy is to support MPPP's mission to document, protect and sustain endangered archaeological treasures in the northern Rio Grande Valley.

MPPP will preserve for the foreseeable future its born-digital assets – the photographs documenting the petroglyphs of Mesa Prieta – and the scans of its paper fieldwork records. Digital preservation and curation will be accomplished by using a Digital Repository compliant to international standards (TRAC, or Trustworthy Repository Audit and Certification, or ISO 16363) to store multiple copies of MPPP's electronic records offsite in professionally monitored environments with reports of file fixity and other monitoring actions to avoid loss through bit rot or other file corruption.

MPPP will make preservation of its digital assets a part of its routine workflows through following the steps in MPPP's Digital Preservation Procedure.

If MPPP should become unable to continue to maintain the above-named digital assets, these digital assets will pass to [Naming of successor organization].

MPPP's board will review the Digital Preservation Policy at least every five years. MPPP's board will review the Digital Preservation Procedures at least every two years.

Date Adopted: _____

Signed: _____

Title: _____

Appendix C – Procedures for MPPP's Preservation Server Finalized for Implementation in NMHRAB Grant Project

Procedures for MPPP's Preservation Server

To fulfill its digital preservation policy adopted in 2015, MPPP preserves and curates its born-digital and scanned holdings (digital photos and scans of field recording documentation) using the TRAC-certified trustworthy digital repository Chronopolis (<http://libraries.ucsd.edu/chronopolis/infrastructure/index.html>) through the user-friendly interface of DuraCloud (<http://www.duracloud.org>). This service stores copies of the same file in three professionally-maintained servers located across the US, and regularly runs file fixity checks on all copies, replacing any copies that get corrupted or lost with a healthy copy from the two other servers. This service is being used as MPPP's preservation server.

The following steps cover how to set up MPPP's office computer to upload files to MPPP's preservation server.

1. Setting up a log in for an individual user

Log ins to MPPP's preservation server should be limited to a small number of individuals with formal roles in MPPP's organization. At no time should a log in be shared with anyone else. An individual approved by MPPP staff and board for administrative access to MPPP's preservation server will do the following:

- a) Create a personal log-in at <https://manage.duracloud.org/ama/users/new>
- b) Have the DuraSpace point of contact on MPPP staff send an email with the selected username to the Product Manager of DuraSpace.
Carissa Smith
Product Manager
DuraSpace
csmith@duraspace.org | (607) 216-4548

2. Log in to MPPP's preservation server

Using your web browser, go to mPPP.duracloud.org and enter your username and password.

3. DuraCloud How-To Documentation

This can be accessed by clicking the Getting Started link near the top right of the page. This documentation can also be accessed without logging in by going directly to <https://wiki.duraspace.org/display/DURACLOUDDOC/Getting+Started+with+DuraCloud>.

4. Automatic Upload Tool: DuraCloud Sync Tool

The documentation and a short tutorial video for the automatic upload tool, called the DuraCloud Sync Tool, can be found at <https://wiki.duraspace.org/display/DURACLOUDDOC/How+to+Automatically+Upload+Files+and+Directories+to+DuraCloud>.

Follow the link for **DuraCloud Sync Tool**, which leads to a page of documentation about the tool and the link to download it to the MPPP computer.
(<https://wiki.duraspace.org/display/DURACLOUDDOC/DuraCloud+Sync+Tool>)

Download the installer that matches the MPPP computer (Windows). Ignore anything about downloading for command line use – you will run the sync tool using a user-friendly graphical user interface (GUI). After the installer downloads, double-click its icon to run the installer. If you do not already have Java installed on your computer, DuraCloud will prompt you to install it by taking you to a trusted source for the download. A DuraCloud video walks you through the install and set up process:
<https://wiki.duraspace.org/display/DURACLOUDDOC/How+to+Automatically+Upload+Files+and+Directories+to+DuraCloud>

Follow the prompts in the installer. The DuraCloud Sync Tool program itself can be installed in the Programs or Applications folder of your hard drive.

Choose **yes** at this prompt: “Would you like the application to start automatically when your computer starts up?”

5. Configuring the DuraCloud Sync Tool

The tool will launch a browser window that lets you configure it. Enter your credentials:

```
mppp.duracloud.org
Your username
Your password
```

Then select the target space for the upload – “mppp” – and click next.

Choosing folders

Now you will see a browsable folder list of directories on your computer. Select any and all folders that contain MPPP's records documenting the cultural resources. This included GIS, digital photos, your database, and scans of field recordings. You will choose the folders one at a time. If there is a high level folder that contains all these folders of material, that will be helpful. Currently DuraCloud doesn't upload the folder name of the most top-level folder. So if you choose a folder “photos” and another folder “photo_data_sheets”, in DuraCloud those folder names won't be present and the contents of the folders will be together. If folder “photos” and folder “photo_data_sheets” both are in another folder “digital_assets” and you choose the top-level folder, the folder name “digital_assets” won't be in DuraCloud but the folders “photos” and “photo_data_sheets” will with all their contents.

Set Sync Policies

Deletion policy: Make sure the checkbox for Sync deletes is NOT checked

Update policy: choose the option for Update but do not overwrite

These settings will allow MPPP to continue to update files on the MPPP computer and have those files backed up the the preservation server. At the same time, if a file on MPPP's computer becomes corrupted, the corrupted file will not overwrite the original file on the preservation server.

On the first time running the Sync Tool

Choose these settings:

- Jumpstart
- Optimize
- Other Options > Optimize automatically

The first time you run the Sync Tool it will take a number of hours to get all your files uploaded into the preservation server. You don't have to wait for the Sync Tool to finish before you go ahead with other tasks on the MPPP computer. After the first time, the Sync Tool will continue to run in the background to upload new or changed files.

6. Restoring files to local machine from Preservation Server

If you encounter the situation where one or a small number of files on MPPP's computer has become corrupt or otherwise damaged, you can download an earlier still good version from the preservation server using the browser interface. If a large amount of files are bad or there has been a hard drive failure or other incident where you need to restore all the files, you can use the DuraSpace Restore Tool (<https://wiki.duraspace.org/display/DURACLOUDDOC/DuraCloud+Features>). You can also contact DuraSpace with details about your situation to obtain their recommendation for how to proceed with a restore.

7. A Note on Chronopolis with DuraCloud

In early 2015, when MPPP is first uploading to the preservation server, the DuraCloud interface will indicate that the storage is going into Amazon Web Services. As discussed in the MOU between MPPP and DuraCloud, this is temporary pending the finalization of the working arrangements between DuraCloud and Chronopolis, and DuraCloud will move the back end of storage for MPPP over to Chronopolis by the end of 2015 and in a manner that is seamless to MPPP.

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